BGA7124

400 MHz to 2700 MHz 0.25 W high linearity silicon amplifier

Rev. 3 — 9 September 2010 Product data sheet

1. Product profile

1.1 General description

The BGA7124 MMIC is a one-stage amplifier, available in a low-cost leadless surface-mount package. It delivers 25 dBm output power at 1 dB gain compression and superior performance up to 2700 MHz. Its power saving features include easy quiescent current adjustment enabling class-AB operation and logic-level shutdown control to reduce the supply current to 4 μA.

1.2 Features and benefits

- 400 MHz to 2700 MHz frequency operating range
- 16 dB small signal gain at 2 GHz
- 25 dBm output power at 1 dB gain compression
- Integrated active biasing
- External matching allows broad application optimization of the electrical performance
- 3.3 V or 5 V single supply operation
- All pins ESD protected

1.3 Applications

- Wireless infrastructure (base station, repeater, backhaul systems)
- Broadband CPE/MoCA
- Industrial applications
- E-metering
- Satellite Master Antenna TV (SMATV)
- WLAN/ISM/RFID

1.4 Quick reference data

Table 1. Quick reference data

Input and output impedances matched to 50 Ω, $\overline{SHDN}$ = HIGH (shutdown disabled). Typical values at V_{CC} = 5 V; I_{CC} = 130 mA; T_{case} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CC}	supply current	V_{CC} = 5.0 V	[1]	50	-	170	mA
f	frequency		[2]	400	-	2700	MHz
G_p	power gain	f = 2140 MHz		14.5	16	17.5	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 2140 MHz		23.5	24.5	-	dBm
$IP3_O$	output third-order intercept point	f = 2140 MHz	[3]	34.5	37.5	-	dBm

[1] The supply current is adjustable; see Section 8.1 “Supply current adjustment”.

[2] Operation outside this range is possible but not guaranteed.

[3] P_L = 11 dBm per tone; spacing = 1 MHz.

2. Pinning information

2.1 Pinning

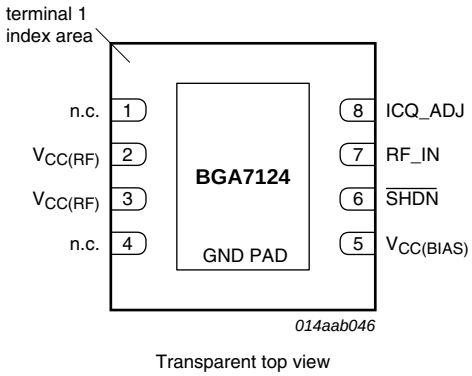


Fig 1. HVSON8 package pin configuration

2.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
n.c.	1, 4	not connected
$V_{CC(RF)}$	2, 3	RF output for the power amplifier and DC supply input for the RF transistor collector [1]
$V_{CC(BIAS)}$	5	bias supply voltage [2]
$\overline{SHDN}$	6	shutdown control function enabled/disabled
RF_IN	7	RF input for the power amplifier [1]
ICQ_ADJ	8	quiescent collector current adjustment controlled by an external resistor
GND	GND pad	RF and DC ground[3]

[1] This pin is DC-coupled and requires an external DC-blocking capacitor.

[2] RF decoupled.

[3] The center metal base of the SOT908-1 also functions as heatsink for the power amplifier.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BGA7124	HVSON8	plastic thermal enhanced very thin small outline package; no leads; 8 terminals; body 3 × 3 × 0.85 mm	SOT908-1

4. Functional diagram

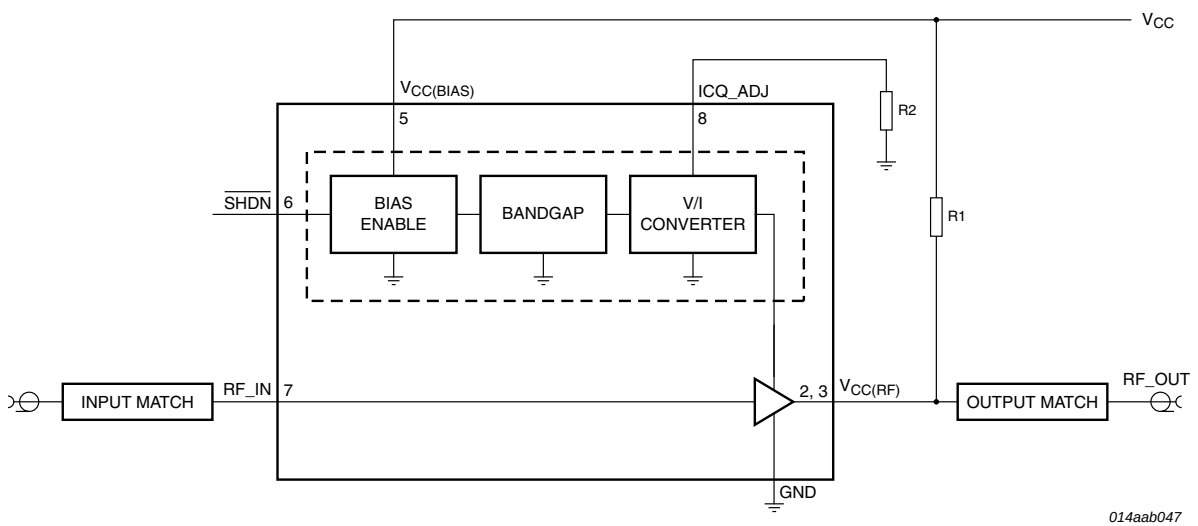


Fig 2. Functional diagram

5. Shutdown control

Table 4. Shutdown control settings

Mode	Mode description	Function description	Pin SHDN	$V_{ctrl(sd)}$ (V)		$I_{ctrl(sd)}$ (μA)	
				Min	Max	Min	Max
Idle	medium power MMIC fully off; minimal supply current	shutdown control enabled	0	0	0.7	-	2
TX	medium power MMIC transmit mode	shutdown control disabled	1	2.5	$V_{CC(BIAS)}$	-	9

6. Limiting values

Table 5. Limiting values

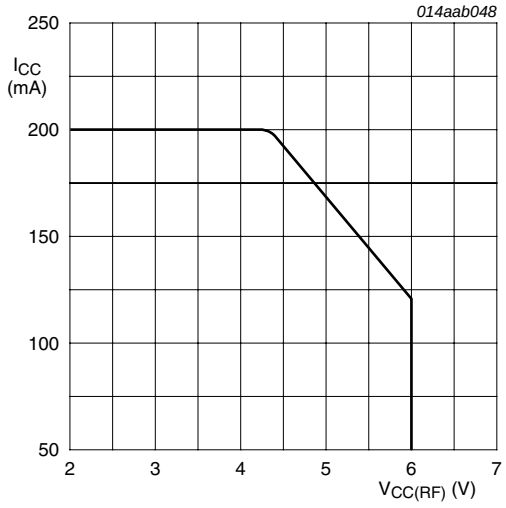
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
$V_{CC(RF)}$	RF supply voltage		[1]	-	6.0	V
$V_{CC(BIAS)}$	bias supply voltage		[1]	-	6.0	V
I_{CC}	supply current		[1][2]	50	200	mA
$V_{ctrl(sd)}$	shutdown control voltage		[3]	0.0	$V_{CC(BIAS)}$	V
$P_{i(RF)}$	RF input power			-	20	dBm
T_{case}	case temperature			–40	+85	°C
T_j	junction temperature			-	150	°C
V_{ESD}	electrostatic discharge voltage	Human Body Model (HBM); According JEDEC standard 22-A114E		-	2000	V
		Charged Device Model (CDM); According JEDEC standard 22-C101B		-	500	V

[1] See Figure 3 for safe operating area.

[2] The supply current is adjustable; see Section 8.1 “Supply current adjustment”.

[3] If $V_{ctrl(sd)}$ exceeds $V_{CC(BIAS)}$, the internal ESD circuit can be damaged. To prevent this, it is recommended that the $I_{ctrl(sd)}$ is limited to 20 mA. If the SHDN function is not used, the SHDN pin should be connected to the $V_{CC(BIAS)}$ pin.



Exceeding the safe operating area limits may cause serious damage to the product.

The impact on I_{CC} due to the spread of the external ICQ resistor (R2) should be taken into account.

The product-spread on I_{CC} should be taken into account (see Section 8 “Static characteristics”).

Fig 3. BGA7124 DC safe operating area

7. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	T_{case} = 85 °C; V_{CC} = 5 V; I_{CC} = 130 mA	[1]	32	-	K/W

[1] defined as thermal resistance from junction to GND paddle.

8. Static characteristics

Table 7. Characteristics

Input and output impedances matched to 50 Ω, pin $\overline{SHDN}$ = HIGH (shutdown disabled). Typical values at V_{CC} = 3.3 V or V_{CC} = 5 V; T_{case} = 25 °C; unless otherwise specified.

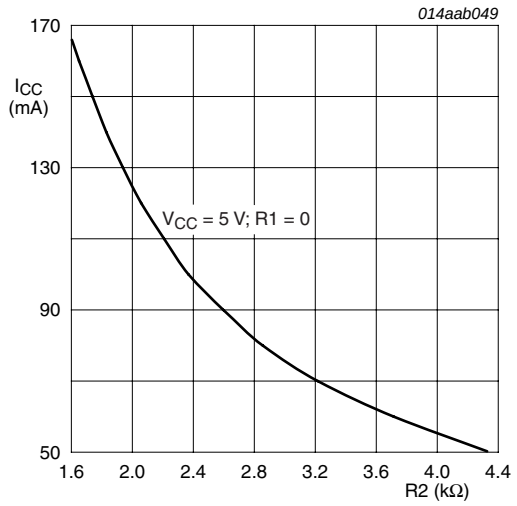
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CC}	supply current	V_{CC} = 3.3 V	[1]	50	-	200	mA
		R1 = 0 Ω; R2 = 1330 Ω	[2]	115	130	145	mA
		R1 = 2.2 Ω; R2 = 1070 Ω	[2]	135	160	185	mA
		V_{CC} = 5.0 V	[1]	50	-	170	mA
		R1 = 0 Ω; R2 = 1960 Ω	[2]	110	130	150	mA
		R1 = 2.2 Ω; R2 = 1650 Ω	[2]	125	150	175	mA
		during shutdown; pin SHDN = LOW (shutdown enabled)		-	4	6	μA

[1] The supply current is adjustable; see Section 8.1 “Supply current adjustment”.

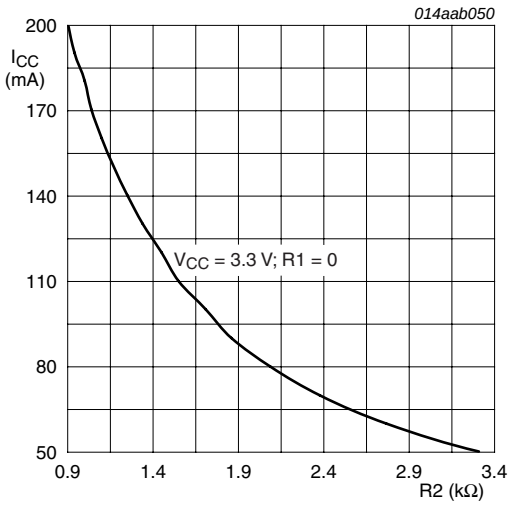
[2] See Section 12 “Application information”.

8.1 Supply current adjustment

The supply current can be adjusted by changing the value of external ICQ resistor (R2); (see Figure 4).



a. 5 V supply voltage.



b. 3.3 V supply voltage

Fig 4. Supply current as a function of the value of R2

9. Dynamic characteristics

Table 8. Characteristics at V_{CC} = 5 V

Input and output impedances matched to 50 Ω, pin $\overline{SHDN}$ = HIGH (shutdown disabled). Typical values at V_{CC} = 5 V; I_{CC} = 130 mA; T_{case} = 25 °C; see Section 12 "Application information"; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
f	frequency		[1]	400	-	2700	MHz
G_p	power gain	for small signals					
		f = 940 MHz		-	22.7	-	dB
		f = 1960 MHz		-	16.4	-	dB
		f = 2140 MHz		14.5	16.0	17.5	dB
		f = 2445 MHz	[2]	-	14.2	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 940 MHz		-	25.0	-	dBm
		f = 1960 MHz		-	24.5	-	dBm
		f = 2140 MHz		23.5	24.5	-	dBm
		f = 2445 MHz	[2]	-	23.5	-	dBm
$IP3_O$	output third-order intercept point	f = 940 MHz	[3]	-	38.5	-	dBm
		f = 1960 MHz	[3]	-	38.0	-	dBm
		f = 2140 MHz	[3]	34.5	37.5	-	dBm
		f = 2445 MHz	[2][3]	-	36.0	-	dBm
NF	noise figure	f = 940 MHz	[4]	-	5.2	-	dB
		f = 1960 MHz	[4]	-	4.6	-	dB
		f = 2140 MHz	[4]	-	4.8	6.5	dB
		f = 2445 MHz	[2][4]	-	5.4	-	dB

Table 8. Characteristics at V_{CC} = 5 V *…continued*

Input and output impedances matched to 50 Ω, pin $\overline{SHDN}$ = HIGH (shutdown disabled). Typical values at V_{CC} = 5 V; I_{CC} = 130 mA; T_{case} = 25 °C; see Section 12 "Application information"; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
RL_{in}	input return loss	f = 940 MHz		-	–15	-	dB
		f = 1960 MHz		-	–11	-	dB
		f = 2140 MHz		-	–17	-	dB
		f = 2445 MHz	[2]	-	–13	-	dB
RL_{out}	output return loss	f = 940 MHz		-	–8	-	dB
		f = 1960 MHz		-	–12	-	dB
		f = 2140 MHz		-	–15	-	dB
		f = 2445 MHz	[2]	-	–25	-	dB

[1] Operation outside this range is possible but not guaranteed.

[2] I_{CC} = 150 mA; see Section 12 "Application information".

[3] P_L = 11 dBm per tone; spacing = 1 MHz.

[4] Defined at P_i = –40 dBm; small signal conditions.

Table 9. Characteristics at V_{CC} = 3.3 V

Input and output impedances matched to 50 Ω, pin $\overline{SHDN}$ = HIGH (shutdown disabled). Typical values at V_{CC} = 3.3 V; I_{CC} = 130 mA; T_{case} = 25 °C, see Section 12 "Application information"; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
f	frequency		[1]	400	-	2700	MHz
G_p	power gain	for small signals					
		f = 940 MHz		-	22.5	-	dB
		f = 2445 MHz	[2]	-	13.8	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 940 MHz		-	23.5	-	dBm
		f = 2445 MHz	[2]	-	22.0	-	dBm
$IP3_O$	output third-order intercept point	f = 940 MHz	[3]	-	36.4	-	dBm
		f = 2445 MHz	[2][3]	-	35.2	-	dBm
NF	noise figure	f = 940 MHz	[4]	-	5.5	-	dB
		f = 2445 MHz	[2][4]	-	5.5	-	dB
RL_{in}	input return loss	f = 940 MHz		-	–15	-	dB
		f = 2445 MHz	[2]	-	–10	-	dB
RL_{out}	output return loss	f = 940 MHz		-	–9	-	dB
		f = 2445 MHz	[2]	-	–25	-	dB

[1] Operation outside this range is possible but not guaranteed.

[2] I_{CC} = 160 mA; see Section 12 "Application information".

[3] P_L= 11 dBm per tone; spacing = 1 MHz.

[4] Defined at P_i = –40 dBm; small signal conditions.

9.1 Scattering parameters

Table 10. Scattering parameters at 5 V, MMIC only

V_{CC} = 5 V; I_{CC} = 130 mA; T_{case} = 25 °C.

f (MHz)	s_{11}		s_{21}		s_{12}		s_{22}	
	Magnitude (ratio)	Angle (degree)	Magnitude (ratio)	Angle (degree)	Magnitude (ratio)	Angle (degree)	Magnitude (ratio)	Angle (degree)
400	0.85	161.56	22.94	82.35	0.01	17.02	0.46	−156.50
500	0.90	159.44	11.82	82.58	0.01	27.08	0.63	176.13
600	0.90	152.15	9.98	73.86	0.01	24.10	0.64	169.61
700	0.89	145.75	8.59	66.00	0.01	21.41	0.64	164.34
800	0.88	139.33	7.55	58.86	0.02	18.47	0.65	159.29
900	0.87	133.19	6.74	51.66	0.02	14.00	0.65	154.44
1000	0.87	127.07	6.14	45.11	0.02	11.25	0.65	149.58
1100	0.87	120.67	5.61	38.20	0.02	7.99	0.65	144.25
1200	0.87	114.18	5.19	31.60	0.02	4.20	0.64	139.60
1300	0.86	107.68	4.82	25.08	0.02	0.31	0.64	134.85
1400	0.86	100.86	4.51	18.49	0.02	−4.01	0.63	130.13
1500	0.86	94.14	4.23	11.74	0.02	−8.65	0.63	125.02
1600	0.86	87.48	3.99	5.25	0.03	−13.15	0.63	120.13
1700	0.86	80.83	3.77	−1.50	0.03	−18.16	0.62	114.98
1800	0.86	74.14	3.56	−8.13	0.03	−23.28	0.62	109.78
1900	0.86	67.39	3.37	−14.94	0.03	−28.54	0.62	104.46
2000	0.86	60.70	3.19	−21.68	0.03	−33.68	0.63	99.01
2100	0.86	53.97	3.02	−28.68	0.03	−39.37	0.63	93.58
2200	0.86	47.78	2.85	−35.14	0.03	−44.84	0.63	88.17
2300	0.86	41.57	2.69	−41.70	0.03	−50.27	0.64	83.06
2400	0.86	35.43	2.54	−48.11	0.03	−55.62	0.64	78.10
2500	0.86	29.74	2.39	−54.19	0.04	−60.71	0.65	73.31
2600	0.86	24.79	2.27	−60.06	0.04	−65.48	0.65	68.64
2700	0.85	19.58	2.15	−66.14	0.04	−70.66	0.66	64.16

Table 11. Scattering parameters at 3.3 V, MMIC only

V_{CC} = 3.3 V; I_{CC} = 130 mA; T_{case} = 25 °C.

f (MHz)	s_{11}		s_{21}		s_{12}		s_{22}	
	Magnitude (ratio)	Angle (degree)	Magnitude (ratio)	Angle (degree)	Magnitude (ratio)	Angle (degree)	Magnitude (ratio)	Angle (degree)
400	0.84	161.94	21.25	73.81	0.01	17.66	0.57	−154.41
500	0.91	159.25	11.56	79.01	0.01	28.15	0.65	178.05
600	0.90	151.98	9.67	70.71	0.01	24.80	0.66	171.32
700	0.90	145.57	8.29	63.37	0.01	21.89	0.66	165.59
800	0.89	139.18	7.26	56.54	0.02	19.04	0.66	160.37
900	0.88	132.87	6.48	49.74	0.02	15.35	0.66	155.28
1000	0.88	126.78	5.90	43.30	0.02	11.89	0.66	150.23
1100	0.87	120.46	5.39	36.53	0.02	8.33	0.66	144.88
1200	0.87	113.94	4.97	30.05	0.02	4.50	0.65	140.03
1300	0.87	107.48	4.62	23.62	0.02	0.35	0.65	135.35
1400	0.87	100.69	4.32	17.15	0.02	−3.92	0.64	130.48
1500	0.86	93.93	4.05	10.48	0.02	−8.62	0.64	125.46
1600	0.86	87.28	3.81	4.05	0.03	−13.28	0.64	120.31
1700	0.86	80.71	3.61	−2.66	0.03	−18.26	0.64	115.13
1800	0.86	74.00	3.40	−9.21	0.03	−23.51	0.64	109.99
1900	0.86	67.27	3.22	−15.97	0.03	−28.87	0.63	104.66
2000	0.86	60.64	3.05	−22.71	0.03	−34.22	0.64	99.36
2100	0.86	53.84	2.89	−29.68	0.03	−39.95	0.64	93.93
2200	0.86	47.60	2.72	−36.12	0.03	−45.44	0.64	88.55
2300	0.86	41.43	2.57	−42.66	0.03	−51.06	0.65	83.38
2400	0.86	35.35	2.42	−49.01	0.04	−56.53	0.65	78.44
2500	0.85	29.64	2.28	−55.12	0.04	−61.72	0.66	73.56
2600	0.85	24.72	2.16	−60.91	0.04	−66.76	0.66	68.80
2700	0.85	19.59	2.04	−66.91	0.04	−71.84	0.67	64.30

10. Reliability information

Table 12. Reliability

Life test	Conditions	Intrinsic failure rate
HTOL	According JESD85; confidence level 60 %; T_j = 55 °C; activation energy = 0.7 eV; acceleration factor determined according Arrhenius	4

11. Moisture sensitivity

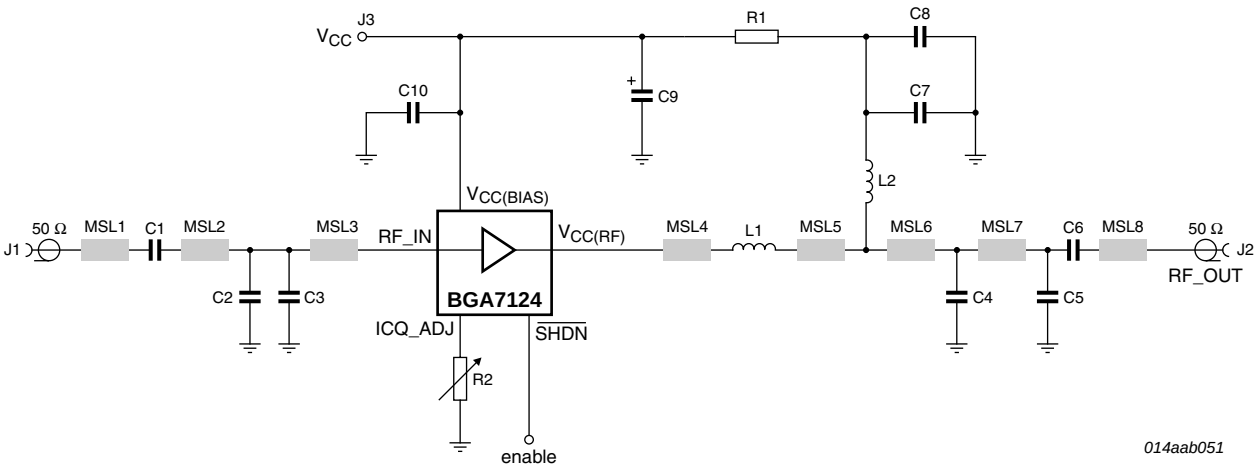
Table 13. Moisture sensitivity level

Test methodology	Class
JESD-22-A113	1

12. Application information

12.1 5 V applications

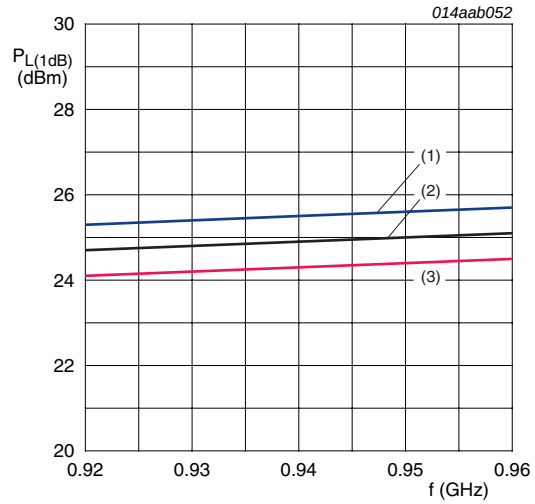
12.1.1 920 MHz to 960 MHz



See Table 14 for a list of components.

PCB board specification: Rogers RO4003C; Height = 0.508 mm; ε_r = 3.38; Copper thickness = 35 μm.

Fig 5. 5 V/130 mA application schematic; 920 MHz to 960 MHz

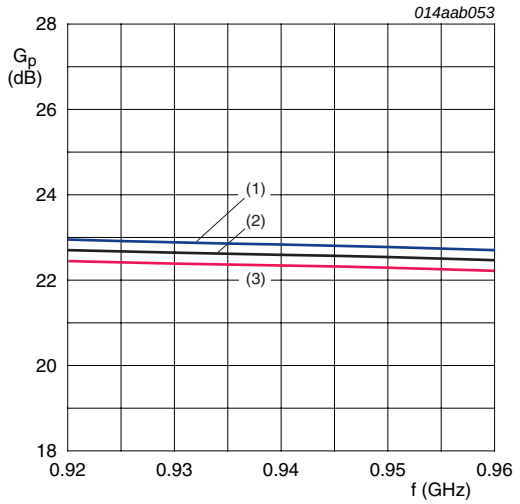


(1) T_{case} = −40 °C.

(2) T_{case} = 25 °C.

(3) T_{case} = 85 °C.

Fig 6. Output power at 1 dB gain compression as a function of frequency

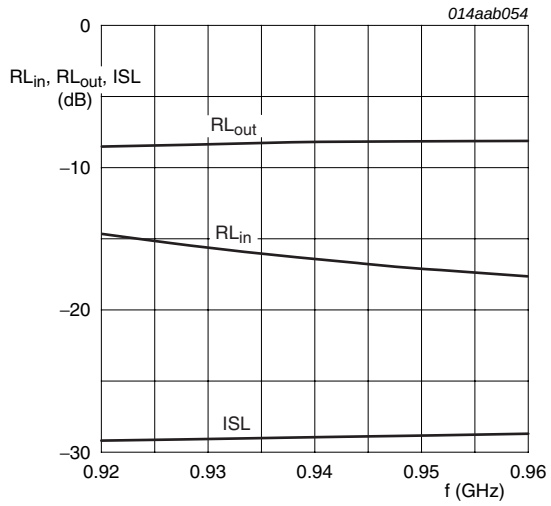


(1) T_{case} = −40 °C.

(2) T_{case} = 25 °C.

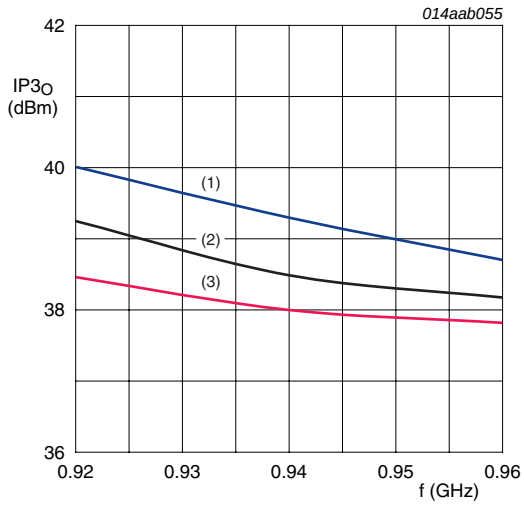
(3) T_{case} = 85 °C.

Fig 7. Power gain as a function of frequency



T_{case} = 25 °C.

Fig 8. Input return loss, output return loss and isolation as a function of frequency

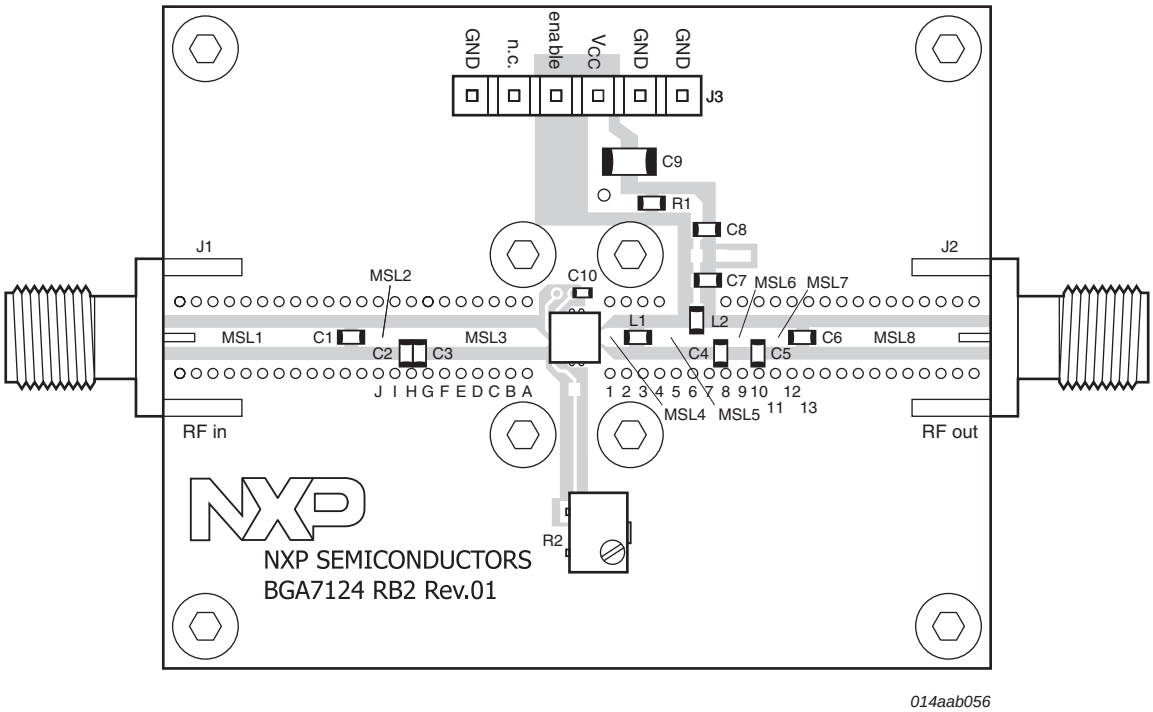


(1) T_{case} = −40 °C.

(2) T_{case} = 25 °C.

(3) T_{case} = 85 °C.

Fig 9. Output third-order intercept point as a function of frequency



See Table 14 for a list of components.

Fig 10. 5 V/130 mA application reference board; 920 MHz to 960 MHz

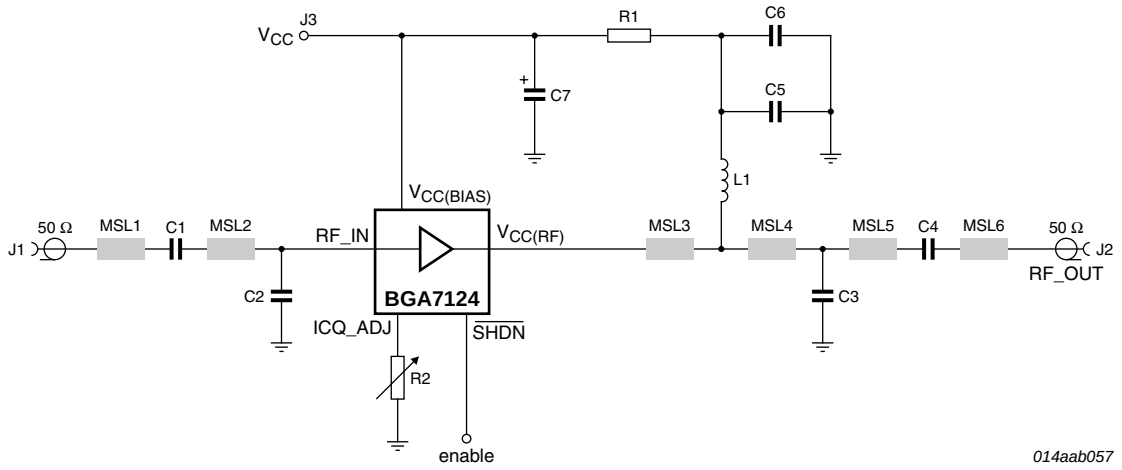
Table 14. 5 V/130 mA application list of components; 920 MHz to 960 MHz

See Figure 5 and Figure 10 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

Component	Description	Value	Function	Remarks
C1, C6	capacitor	68 pF	DC blocking	Murata GRM1885C1H680JA01D
C2, C3	capacitor	3.3 pF	input match	Murata GRM1885C1H3R3CZ01D
C4	capacitor	3.9 pF	output match	Murata GRM1885C1H3R9CZ01D
C5	capacitor	1.0 pF	output match	Murata GRM1885C1H1R0CZ01D
C7	capacitor	68 pF	RF decoupling	Murata GRM1885C1H680JA01D
C8	capacitor	100 nF	DC decoupling	AVX 0603YC104KAT2A
C9	capacitor	10 μF	DC decoupling	AVX 1206ZG106ZAT2A
C10	capacitor	12 pF	noise decoupling	Murata GRM1555C1H120JZ01D
J1, J2	RF connector	SMA		Emerson Network Power 142-0701-841
J3	DC connector	6-pins		MOLEX
L1	inductor	2.2 nH	output match	Tyco electronics 36501J2N2JTDG
L2	inductor	22 nH	DC feed	Tyco electronics 36501J022JTDG
MSL1[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	input match	
MSL2[1]	micro stripline	1.14 mm × 0.8 mm × 2.95 mm	input match	
MSL3[1]	micro stripline	1.14 mm × 0.8 mm × 7.75 mm	input match	
MSL4[1]	micro stripline	1.14 mm × 0.8 mm × 23.4 mm	output match	
MSL5[1]	micro stripline	1.14 mm × 0.8 mm × 2.2 mm	output match	
MSL6[1]	micro stripline	1.14 mm × 0.8 mm × 3.15 mm	output match	
MSL7[1]	micro stripline	1.14 mm × 0.8 mm × 2.3 mm	output match	
MSL8[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	output match	
R1	resistor	0 Ω		Multicomp MC 0.063W 0603 0R
R2	resistor (trimmer)	2 kΩ	bias adjustment	Bourns 3214W-1-202E

[1] MSL1 to MSL8 dimensions specified as Width (W), Spacing (S) and Length (L).

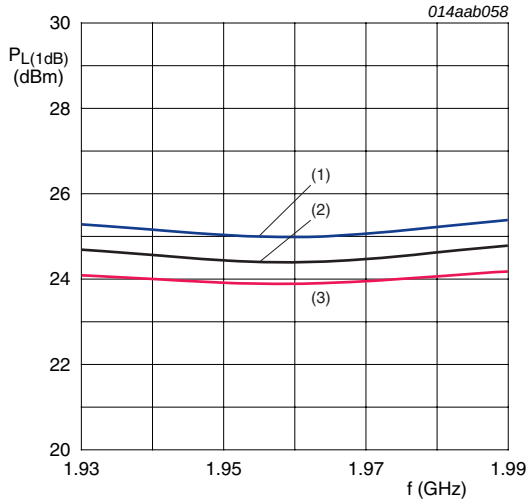
12.1.2 1930 MHz to 1990 MHz



See Table 15 for a list of components.

PCB board specification: Rogers RO4003C; Height = 0.508 mm; ε_r = 3.38; Copper thickness = 35 μm.

Fig 11. 5 V/130 mA application schematic; 1930 MHz to 1990 MHz

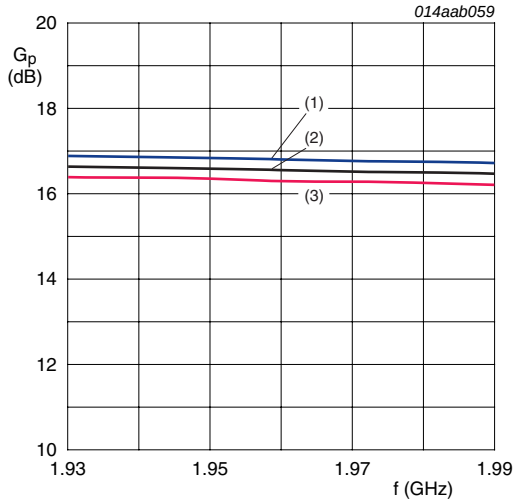


(1) T_{case} = −40 °C.

(2) T_{case} = 25 °C.

(3) T_{case} = 85 °C.

Fig 12. Output power at 1 dB gain compression as a function of frequency

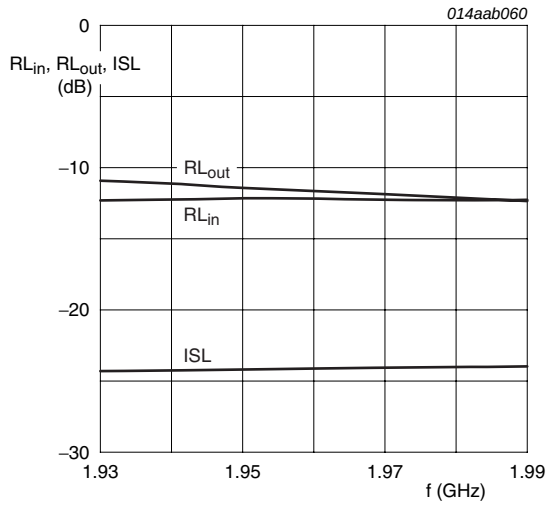


(1) T_{case} = −40 °C.

(2) T_{case} = 25 °C.

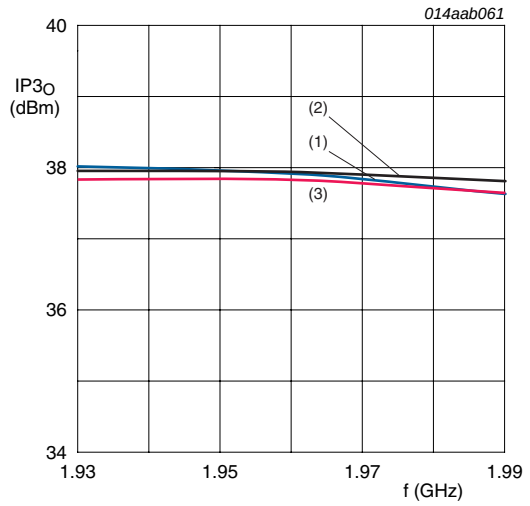
(3) T_{case} = 85 °C.

Fig 13. Power gain as a function of frequency



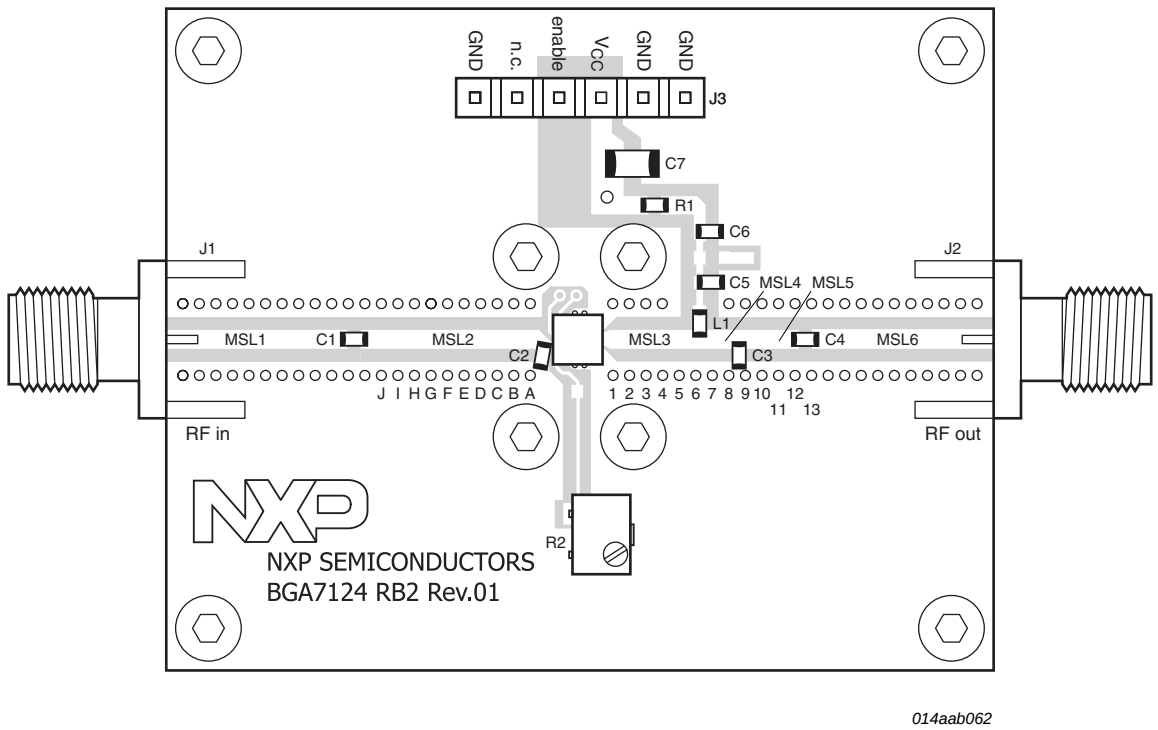
T_{case} = 25 °C.

Fig 14. Input return loss, output return loss and isolation as a function of frequency



(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 15. Output third-order intercept point as a function of frequency



See Table 15 for a list of components.

Fig 16. 5 V/130 mA application reference board; 1930 MHz to 1990 MHz

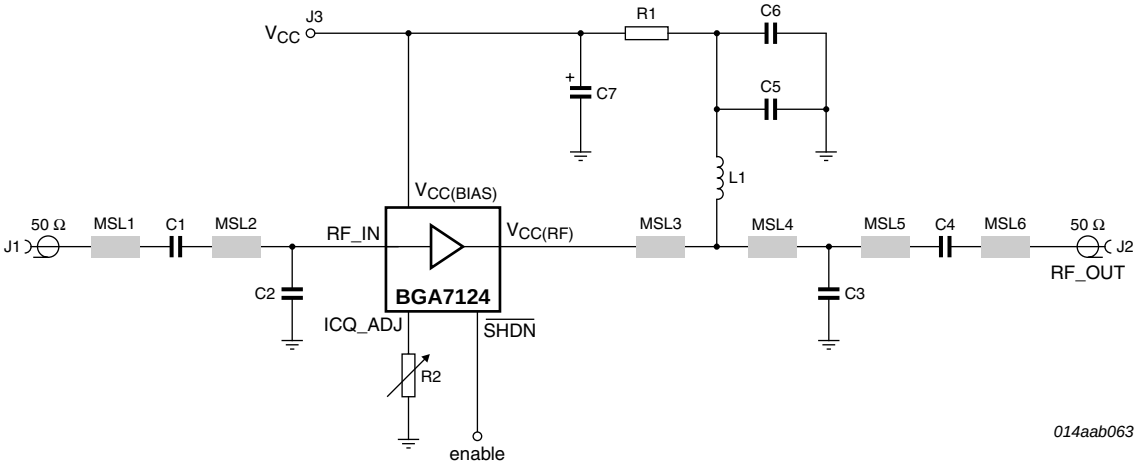
Table 15. 5 V/130 mA application list of components; 1930 MHz to 1990 MHz

See Figure 11 and Figure 16 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

Component	Description	Value	Function	Remarks
C1, C4	capacitor	15 pF	DC blocking	Murata GRM1885C1H150JA01D
C2	capacitor	2.2 pF	input match	Murata GRM1885C1H2R2CZ01D
C3	capacitor	1.2 pF	output match	Murata GRM1885C1H1R2CZ01D
C5	capacitor	15 pF	RF decoupling	Murata GRM1885C1H150JA01D
C6	capacitor	100 nF	DC decoupling	AVX 0603YC104KAT2A
C7	capacitor	10 μF	DC decoupling	AVX 1206ZG106ZAT2A
J1, J2	RF connector	SMA		Emerson Network Power 142-0701-841
J3	DC connector	6-pins		MOLEX
L1	inductor	22 nH	DC feed	Tyco electronics 36501J022JTDG
MSL1[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	input match	
MSL2[1]	micro stripline	1.14 mm × 0.8 mm × 10.8 mm	input match	
MSL3[1]	micro stripline	1.14 mm × 0.8 mm × 5.8 mm	output match	
MSL4[1]	micro stripline	1.14 mm × 0.8 mm × 2.2 mm	output match	
MSL5[1]	micro stripline	1.14 mm × 0.8 mm × 3.7 mm	output match	
MSL6[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	output match	
R1	resistor	0 Ω		Multicomp MC 0.063W 0603 0R
R2	resistor (trimmer)	2 kΩ	bias adjustment	Bourns 3214W-1-202E

[1] MSL1 to MSL6 dimensions specified as Width (W), Spacing (S) and Length (L).

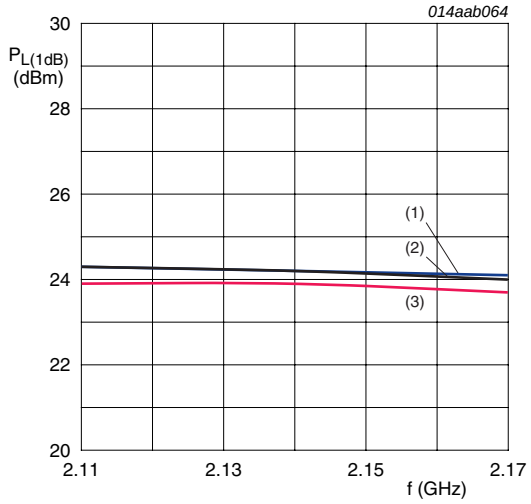
12.1.3 2110 MHz to 2170 MHz



See Table 16 for a list of components.

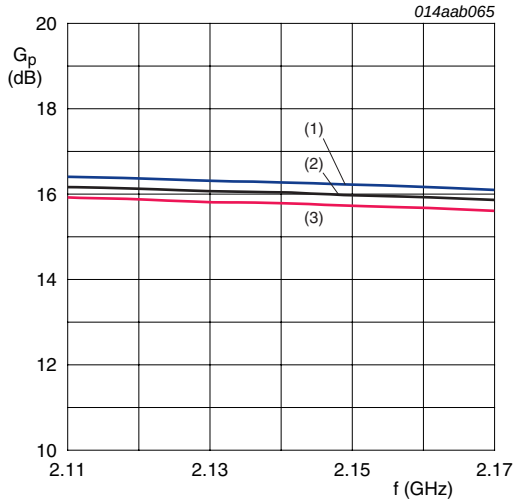
PCB board specification: Rogers RO4003C; Height = 0.508 mm; ε_r = 3.38; Copper thickness = 35 μm.

Fig 17. 5 V/130 mA application schematic; 2110 MHz to 2170 MHz



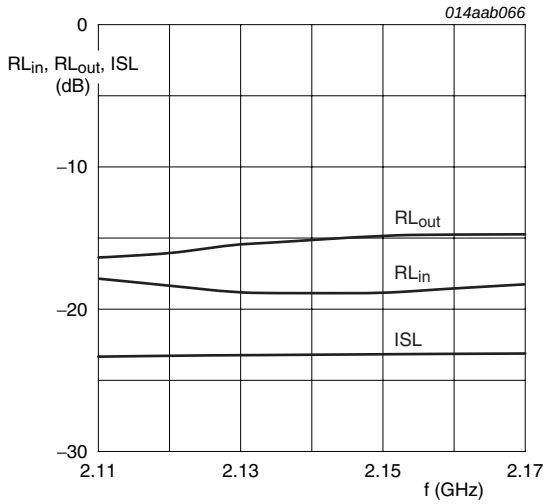
(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 18. Output power at 1 dB gain compression as a function of frequency



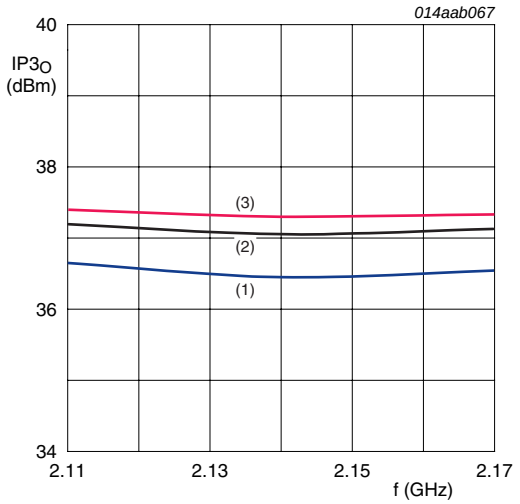
(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 19. Power gain as a function of frequency



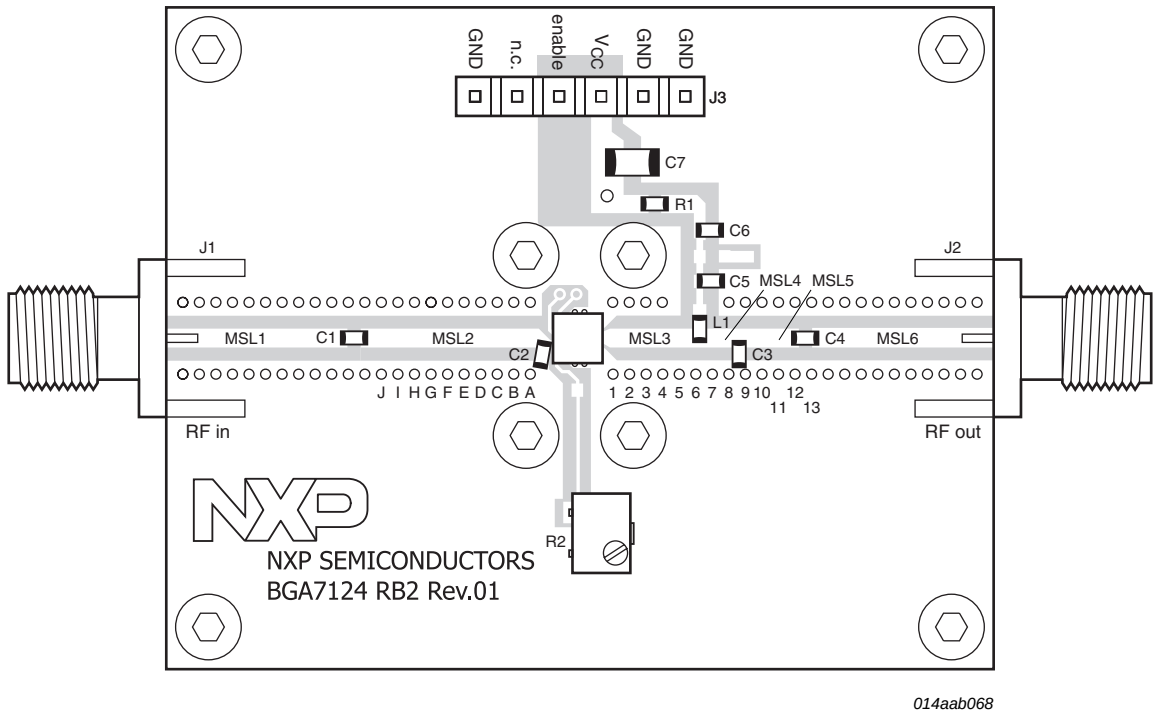
T_{case} = 25 °C.

Fig 20. Input return loss, output return loss and isolation as a function of frequency



(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 21. Output third-order intercept point as a function of frequency



See Table 16 for a list of components.

Fig 22. 5 V/130 mA application reference board; 2110 MHz to 2170 MHz

Table 16. 5 V/130 mA application list of components; 2110 MHz to 2170 MHz

See Figure 17 and Figure 22 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

Component	Description	Value	Function	Remarks
C1, C4	capacitor	15 pF	DC blocking	Murata GRM1885C1H150JA01D
C2	capacitor	2.7 pF	input match	Murata GRM1885C1H2R7CZ01D
C3	capacitor	1.5 pF	output match	Murata GRM1885C1H1R5CZ01D
C5	capacitor	15 pF	RF decoupling	Murata GRM1885C1H150JA01D
C6	capacitor	100 nF	DC decoupling	AVX 0603YC104KAT2A
C7	capacitor	10 μF	DC decoupling	AVX 1206ZG106ZAT2A
J1, J2	RF connector	SMA		Emerson Network Power 142-0701-841
J3	DC connector	6-pins		MOLEX
L1	inductor	22 nH	DC feed	Tyco electronics 36501J022JTDG
MSL1[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	input match	
MSL2[1]	micro stripline	1.14 mm × 0.8 mm × 10.8 mm	input match	
MSL3[1]	micro stripline	1.14 mm × 0.8 mm × 5.8 mm	output match	
MSL4[1]	micro stripline	1.14 mm × 0.8 mm × 2.5 mm	output match	
MSL5[1]	micro stripline	1.14 mm × 0.8 mm × 3.5 mm	output match	

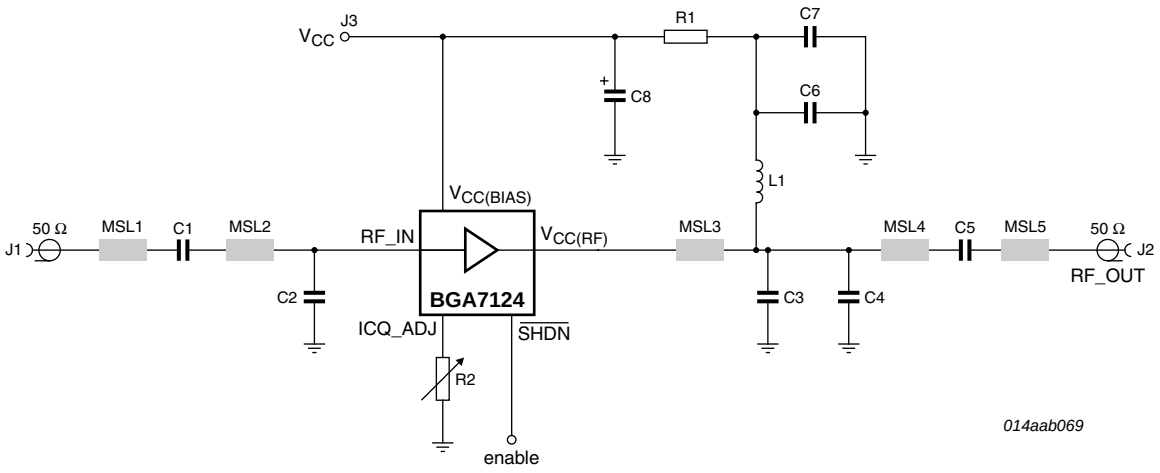
Table 16. 5 V/130 mA application list of components; 2110 MHz to 2170 MHz *...continued*

See Figure 17 and Figure 22 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

Component	Description	Value	Function	Remarks
MSL6[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	output match	
R1	resistor	0 Ω		Multicomp MC 0.063W 0603 0R
R2	resistor (trimmer)	2 kΩ	bias adjustment	Bourns 3214W-1-202E

[1] MSL1 to MSL6 dimensions specified as Width (W), Spacing (S) and Length (L).

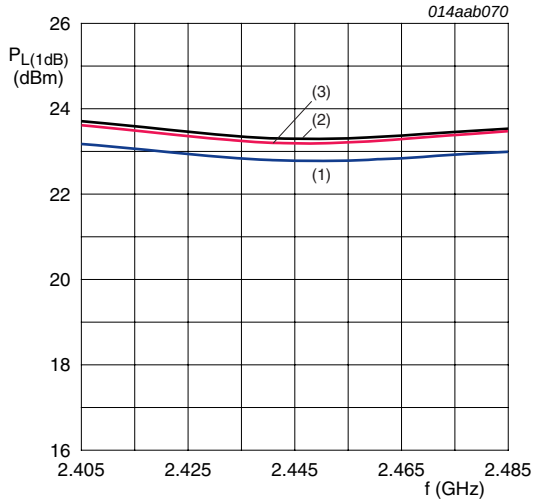
12.1.4 2405 MHz to 2485 MHz



See Table 17 for a list of components.

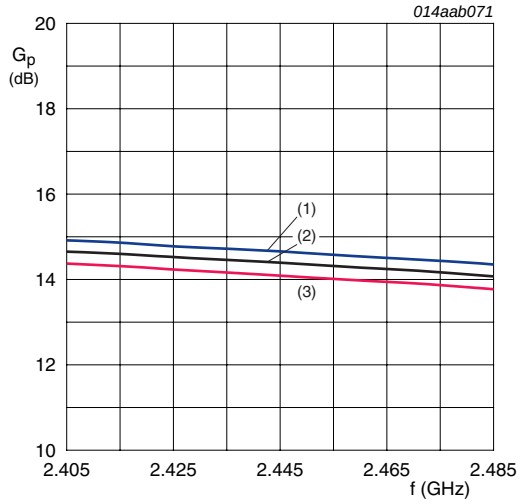
PCB board specification: Rogers RO4003C; Height = 0.508 mm; ε_r = 3.38; Copper thickness = 35 μm.

Fig 23. 5 V/130 mA application schematic; 2405 MHz to 2485 MHz



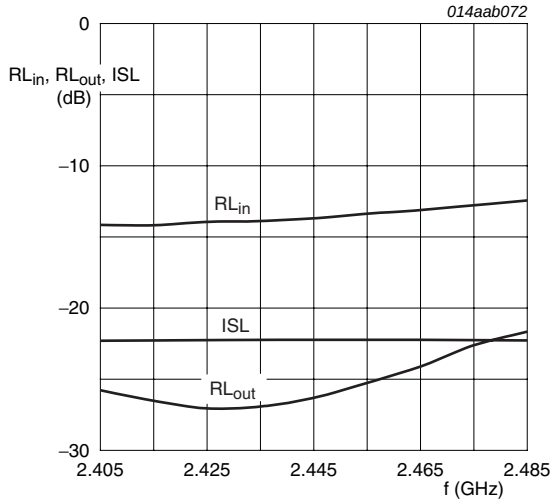
(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 24. Output power at 1 dB gain compression as a function of frequency



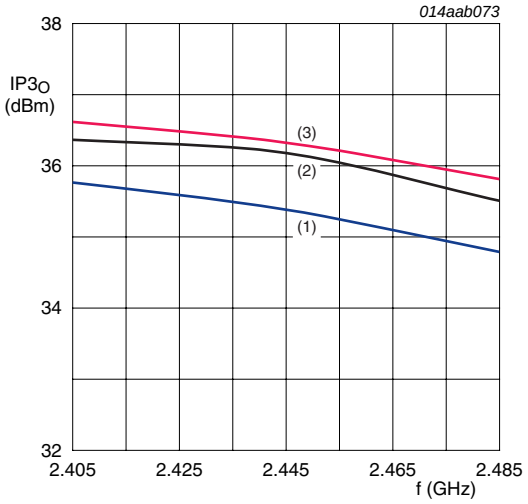
(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 25. Power gain as a function of frequency



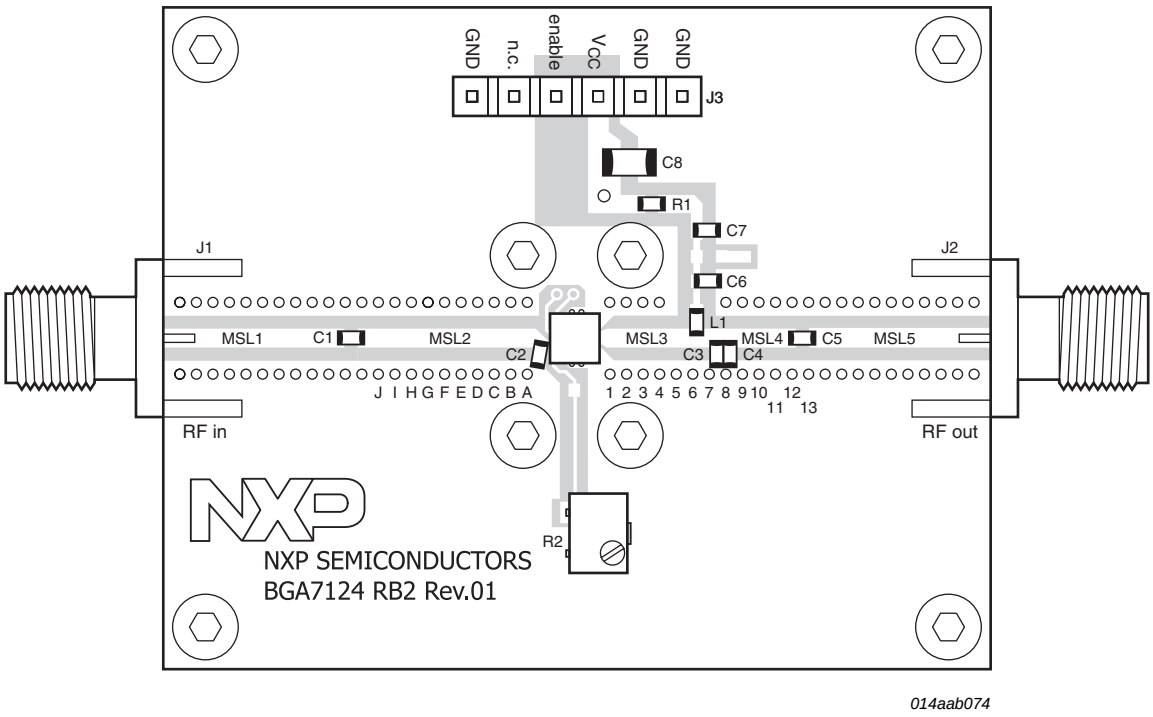
T_{case} = 25 °C.

Fig 26. Input return loss, output return loss and isolation as a function of frequency



(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 27. Output third-order intercept point as a function of frequency



See Table 17 for a list of components.

Fig 28. 5 V/130 mA application reference board; 2405 MHz to 2485 MHz

Table 17. 5 V/130 mA application list of components; 2405 MHz to 2485 MHz

See Figure 23 and Figure 28 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

Component	Description	Value	Function	Remarks
C1, C5	capacitor	12 pF	DC blocking	Murata GRM1885C1H120JA01D
C2	capacitor	2.2 pF	input match	Murata GRM1885C1H2R2CZ01D
C3	capacitor	0.82 pF	output match	Murata GRM1885C1HR82CZ01D
C4	capacitor	0.68 pF	output match	Murata GRM1885C1HR68CZ01D
C6	capacitor	12 pF	RF decoupling	Murata GRM1885C1H120JA01D
C7	capacitor	100 nF	DC decoupling	AVX 0603YC104KAT2A
C8	capacitor	10 μF	DC decoupling	AVX 1206ZG106ZAT2A
J1, J2	RF connector	SMA		Emerson Network Power 142-0701-841
J3	DC connector	6-pins		MOLEX
L1	inductor	22 nH	DC feed	Tyco electronics 36501J022JTDG
MSL1[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	input match	
MSL2[1]	micro stripline	1.14 mm × 0.8 mm × 10.8 mm	input match	
MSL3[1]	micro stripline	1.14 mm × 0.8 mm × 7.3 mm	output match	
MSL4[1]	micro stripline	1.14 mm × 0.8 mm × 4.3 mm	output match	

Table 17. 5 V/130 mA application list of components; 2405 MHz to 2485 MHz *...continued*

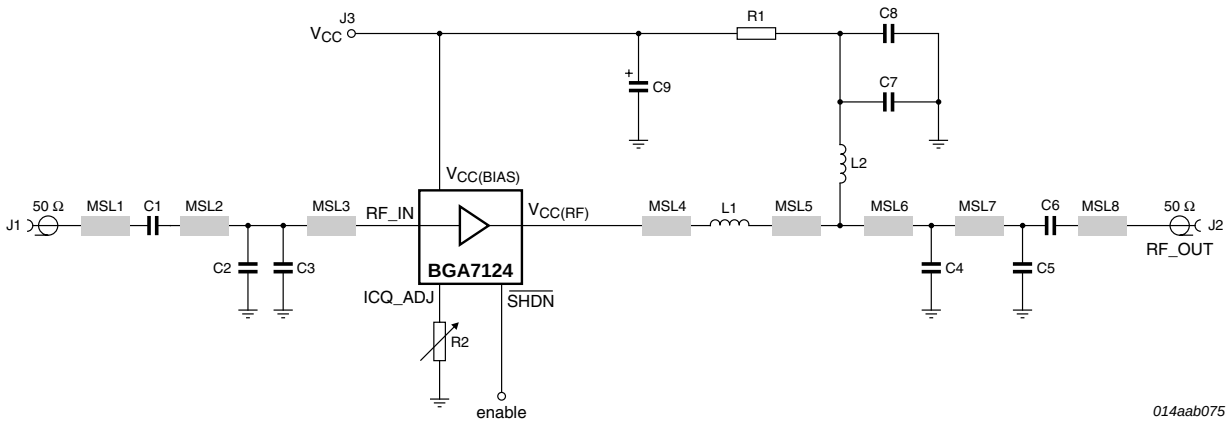
See Figure 23 and Figure 28 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

Component	Description	Value	Function	Remarks
MSL5[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	output match	
R1	resistor	2.2 Ω		Multicomp MC 0.063W 0603 2R2
R2	resistor (trimmer)	2 kΩ	bias adjustment	Bourns 3214W-1-202E

[1] MSL1 to MSL5 dimensions specified as Width (W), Spacing (S) and Length (L).

12.2 3.3 V applications

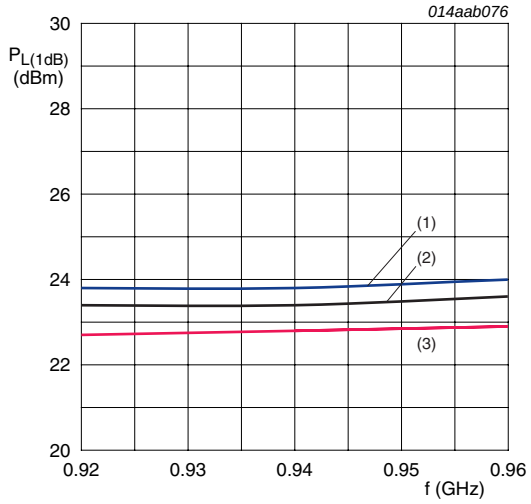
12.2.1 920 MHz to 960 MHz



See Table 18 for a list of components.

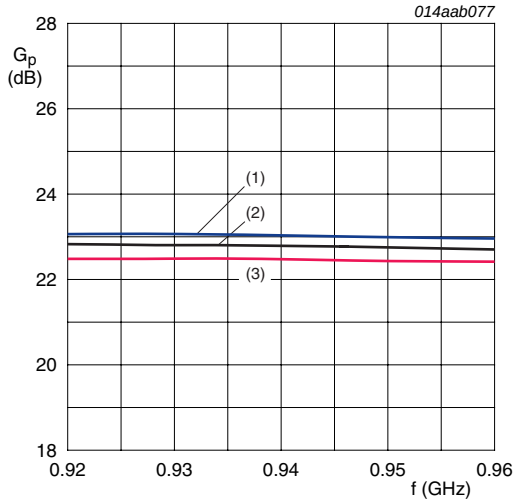
PCB board specification: Rogers RO4003C; Height = 0.508 mm; ε_r = 3.38; Copper thickness = 35 μm.

Fig 29. 3.3 V/130 mA application schematic; 920 MHz to 960 MHz



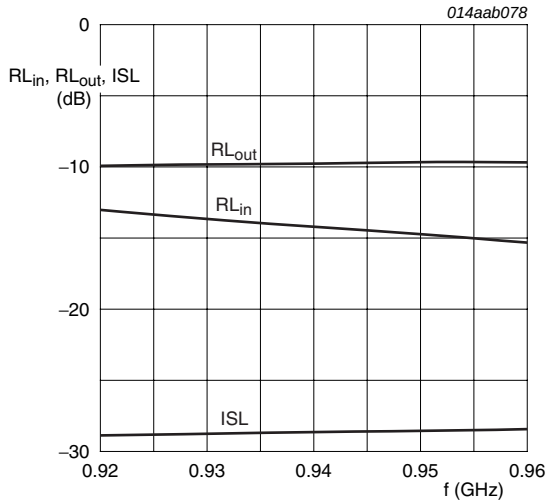
(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 30. Output power at 1 dB gain compression as a function of frequency



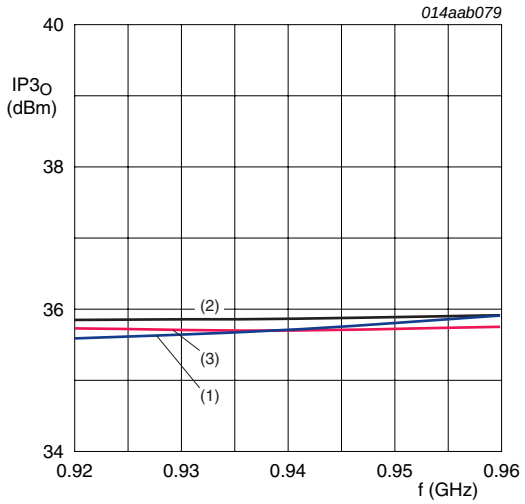
(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 31. Power gain as a function of frequency



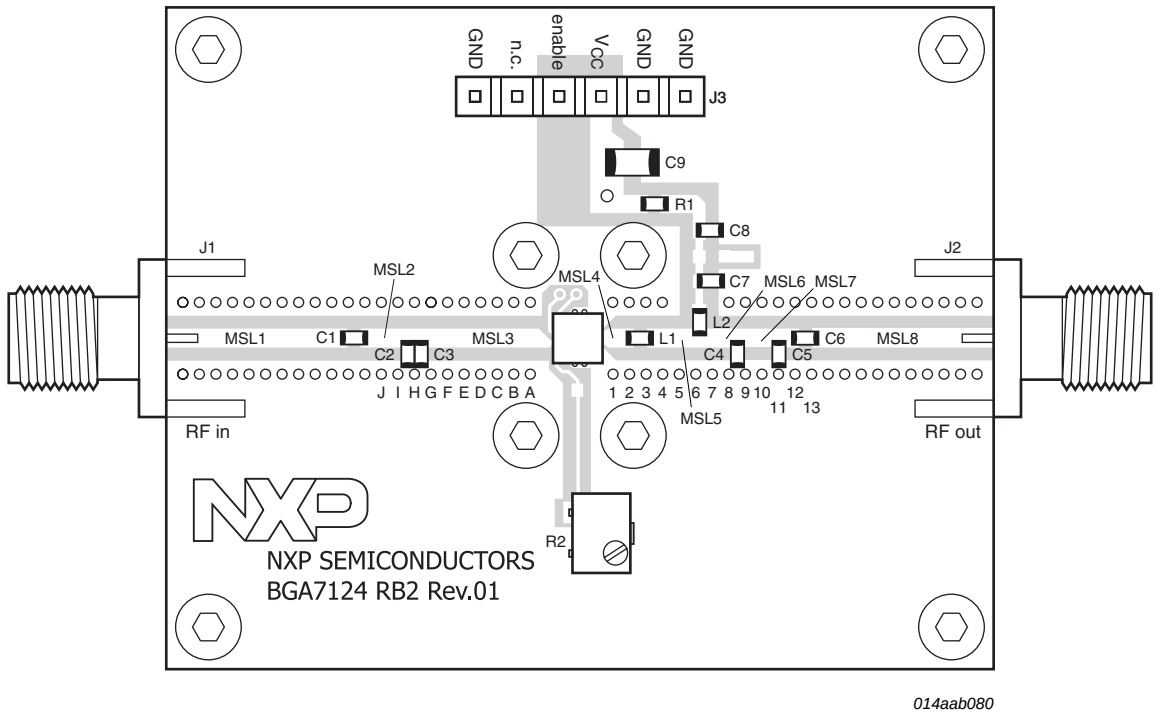
T_{case} = 25 °C.

Fig 32. Input return loss, output return loss and isolation as a function of frequency



(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 33. Output third-order intercept point as a function of frequency



See Table 18 for a list of components.

Fig 34. 3.3 V/130 mA application reference board; 920 MHz to 960 MHz

Table 18. 3.3 V/130 mA application list of components; 920 MHz to 960 MHz

See Figure 29 and Figure 34 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

Component	Description	Value	Function	Remarks
C1, C6	capacitor	68 pF	DC blocking	Murata GRM1885C1H680JA01D
C2, C3	capacitor	3.3 pF	input match	Murata GRM1885C1H3R3CZ01D
C4	capacitor	3.9 pF	output match	Murata GRM1885C1H3R9CZ01D
C5	capacitor	1.0 pF	output match	Murata GRM1885C1H1R0CZ01D
C7	capacitor	68 pF	RF decoupling	Murata GRM1885C1H680JA01D
C8	capacitor	100 nF	DC decoupling	AVX 0603YC104KAT2A
C9	capacitor	10 μF	DC decoupling	AVX 1206ZG106ZAT2A
J1, J2	RF connector	SMA		Emerson Network Power 142-0701-841
J3	DC connector	6-pins		MOLEX
L1	inductor	2.2 nH	output match	Tyco electronics 36501J2N2JTDG
L2	inductor	22 nH	DC feed	Tyco electronics 36501J022JTDG
MSL1[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	input match	
MSL2[1]	micro stripline	1.14 mm × 0.8 mm × 2.95 mm	input match	
MSL3[1]	micro stripline	1.14 mm × 0.8 mm × 7.75 mm	input match	
MSL4[1]	micro stripline	1.14 mm × 0.8 mm × 23.4 mm	output match	
MSL5[1]	micro stripline	1.14 mm × 0.8 mm × 2.2 mm	output match	

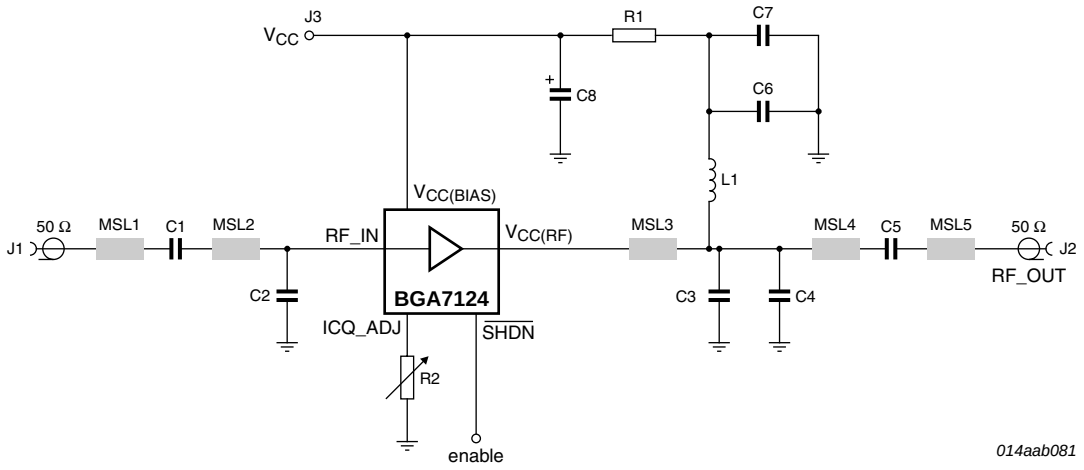
Table 18. 3.3 V/130 mA application list of components; 920 MHz to 960 MHz *...continued*

See Figure 29 and Figure 34 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

Component	Description	Value	Function	Remarks
MSL6[1]	micro stripline	1.14 mm × 0.8 mm × 2.4 mm	output match	
MSL7[1]	micro stripline	1.14 mm × 0.8 mm × 2.3 mm	output match	
MSL8[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	output match	
R1	resistor	0 Ω		Multicomp MC 0.063W 0603 0R
R2	resistor (trimmer)	2 kΩ	bias adjustment	Bourns 3214W-1-202E

[1] MSL1 to MSL8 dimensions specified as Width (W), Spacing (S) and Length (L).

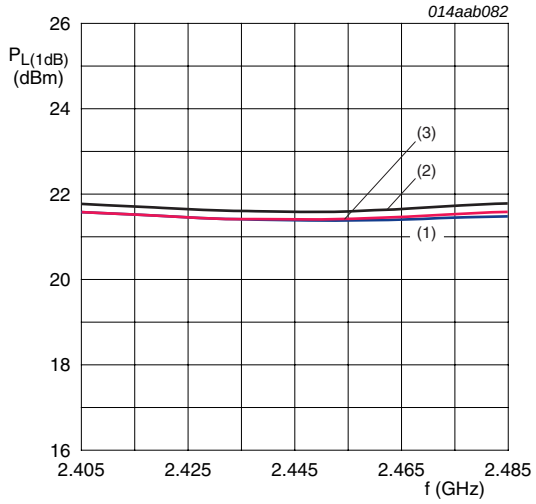
12.2.2 2405 MHz to 2485 MHz



See Table 19 for a list of components.

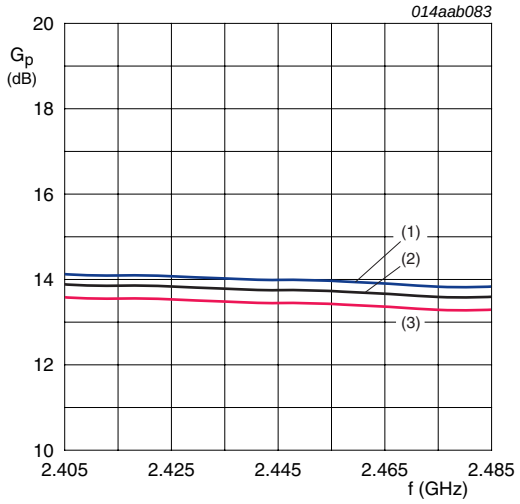
PCB board specification: Rogers RO4003C; Height = 0.508 mm; ε_r = 3.38; Copper thickness = 35 μm

Fig 35. 3.3 V/130 mA application schematic; 2405 MHz to 2485 MHz



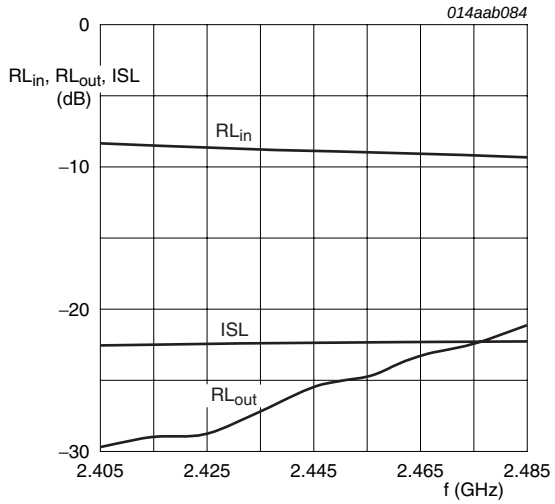
(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 36. Output power at 1 dB gain compression as a function of frequency



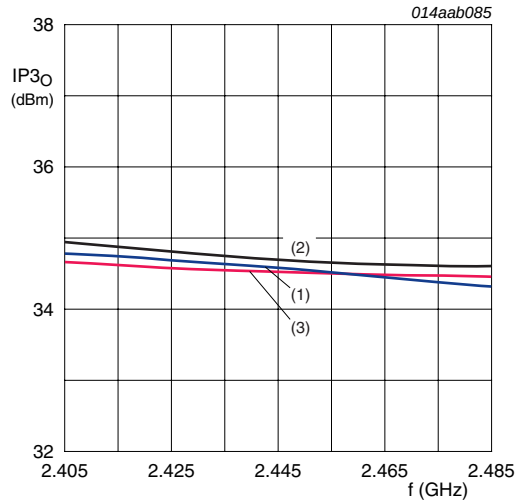
(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 37. Power gain as a function of frequency



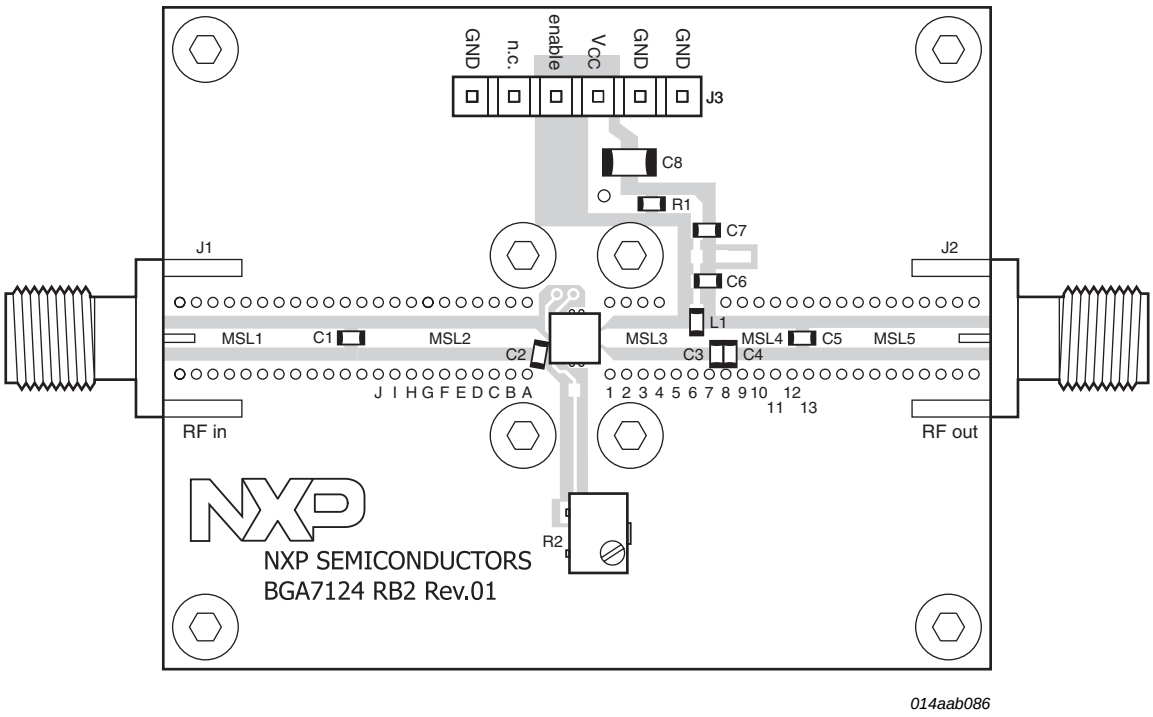
T_{case} = 25 °C.

Fig 38. Input return loss, output return loss and isolation as a function of frequency



(1) T_{case} = −40 °C.
(2) T_{case} = 25 °C.
(3) T_{case} = 85 °C.

Fig 39. Output third-order intercept point as a function of frequency



See Table 19 for a list of components.

Fig 40. 3.3 V/130 mA application reference board; 2405 MHz to 2485 MHz

Table 19. 3.3 V/130 mA application list of components; 2405 MHz to 2485 MHz

See Figure 35 and Figure 40 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

Component	Description	Value	Function	Remarks
C1, C5	capacitor	12 pF	DC blocking	Murata GRM1885C1H120JA01D
C2	capacitor	2.2 pF	input match	Murata GRM1885C1H2R2CZ01D
C3	capacitor	0.82 pF	output match	Murata GRM1885C1HR82CZ01D
C4	capacitor	0.68 pF	output match	Murata GRM1885C1HR68CZ01D
C6	capacitor	12 pF	RF decoupling	Murata GRM1885C1H120JA01D
C7	capacitor	100 nF	DC decoupling	AVX 0603YC104KAT2A
C8	capacitor	10 μF	DC decoupling	AVX 1206ZG106ZAT2A
J1, J2	RF connector	SMA		Emerson Network Power 142-0701-841
J3	DC connector	6-pins		MOLEX
L1	inductor	22 nH	DC feed	Tyco electronics 36501J022JTDG
MSL1[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	input match	
MSL2[1]	micro stripline	1.14 mm × 0.8 mm × 10.8 mm	input match	
MSL3[1]	micro stripline	1.14 mm × 0.8 mm × 7.3 mm	output match	
MSL4[1]	micro stripline	1.14 mm × 0.8 mm × 4.3 mm	output match	

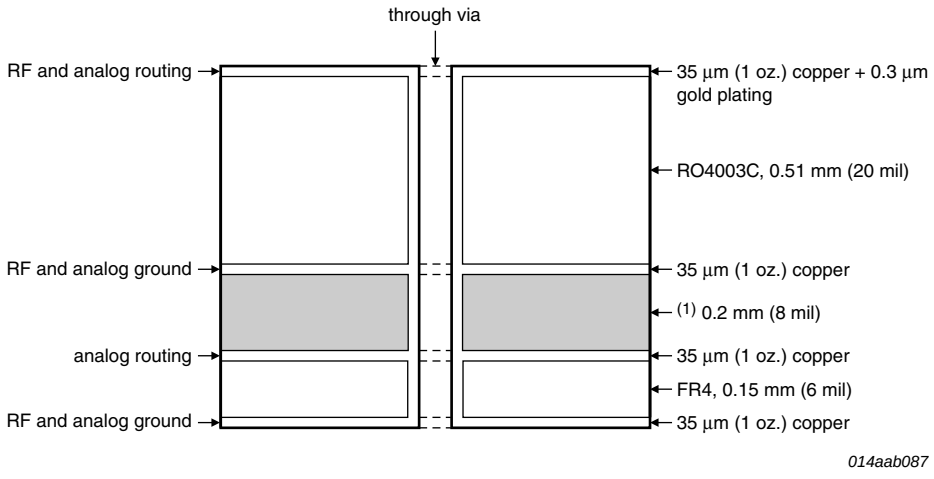
Table 19. 3.3 V/130 mA application list of components; 2405 MHz to 2485 MHz *...continued*

See Figure 35 and Figure 40 for component layout. Printed-Circuit Board (PCB): Rogers RO4003C stack; height = 0.508 mm; copper plating thickness = 35 μm.

Component	Description	Value	Function	Remarks
MSL5[1]	micro stripline	1.14 mm × 0.8 mm × 10.95 mm	output match	
R1	resistor	2.2 Ω		Multicomp MC 0.063W 0603 2R2
R2	resistor (trimmer)	2 kΩ	bias adjustment	Bourns 3214W-1-202E

[1] MSL1 to MSL5 dimensions specified as Width (W), Spacing (S) and Length (L).

12.3 PCB stack

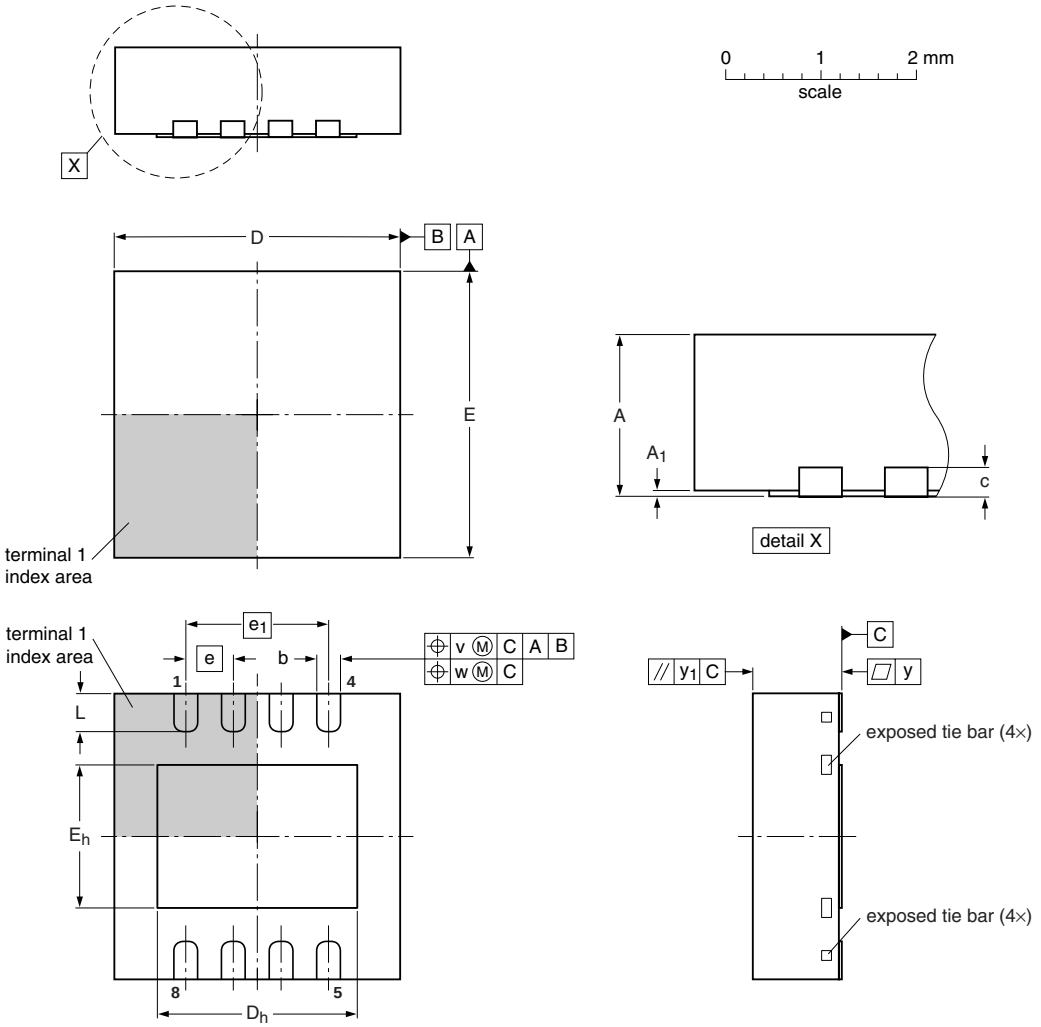


(1) Pre-pregnated
RO4003Cdielectric constant ε_r = 3.38

Fig 41. PCB stack

13. Package outline

HVSON8: plastic thermal enhanced very thin small outline package; no leads; 8 terminals; body 3 x 3 x 0.85 mm **SOT908-1**



DIMENSIONS (mm are the original dimensions)

UNIT	$A^{(1)}$ max.	A_1	b	c	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.3 0.2	0.2	3.1 2.9	2.25 1.95	3.1 2.9	1.65 1.35	0.5	1.5	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT908-1		MO-229				~~05-09-26~~ 05-10-05

Fig 42. Package outline SOT908-1 (HVSON8)

14. Abbreviations

Table 20. Abbreviations

Acronym	Description
CPE	Customer-Premises Equipment
DC	Direct Current
ESD	ElectroStatic Discharge
HTOL	High Temperature Operating Life
ISM	Industrial, Scientific and Medical
MMIC	Monolithic Microwave Integrated Circuit
MoCA	Multimedia over Coax Alliance
RFID	Radio Frequency IDentification
SMA	SubMiniature version A
TX	Transmit
WLAN	Wireless Local Area Network

15. Revision history

Table 21. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGA7124 v.3	20100909	Product data sheet	-	BGA7124 v.2
Modifications:	• Figure 5 on page 11: MSL symbols have been corrected. • Figure 11 on page 14: MSL symbols have been corrected. • Figure 17 on page 16: MSL symbols have been corrected. • Figure 23 on page 19: MSL symbols have been corrected. • Figure 29 on page 22: MSL symbols have been corrected. • Figure 35 on page 25: MSL symbols have been corrected.			
BGA7124 v.2	20100623	Product data sheet	-	BGA7124 v.1
BGA7124 v.1	20100421	Product data sheet	-	-

16. Legal information

16.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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18. Contents

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